EUB Alberta Energy and Utilities Board

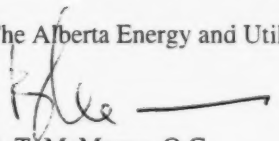
640 – 5 Avenue SW Calgary, Alberta Canada T2P 3G4 Tel 403 297-8311 Fax 403 291-7336 www.eub.ca

Directive 007-1

September 13, 2007

Directive 007-1: Allowables Handbook—Guidelines for the Calculation of Monthly Production Allowables in Alberta

The Alberta Energy and Utilities Board (EUB/Board) has approved this directive on September 13, 2007.



B. T. McManus, Q.C.
Acting Chairman

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1 Introduction

This directive explains the factors used and calculations involved in the determination of monthly allowables for production entities (well or block). Allowables, or maximum rate limitations (MRLs), are rate controls applied primarily to oil entities in accordance with a Board order and are the major focus of this directive. MRLs are assigned to new pools when conservation is or could potentially be an issue. They help ensure that enhanced oil recovery (EOR) feasibility and gas conservation are addressed before pools are significantly depleted. MRLs help to minimize gas cap depletion until decisions are made on concurrent production and also serve to maintain intra-pool equity. For gas wells, allowables are applied primarily for equity reasons in the administration of off-target penalties (see Section 7).

Examples are presented to illustrate overall concepts and procedures, and a glossary is included for reference. All figures cited in the directive appear at the end.

For further clarification on any topic presented in this directive, contact the Reserves and Allowables Section of the EUB Geology and Reserves Group at (403) 297-8354 or (403) 297-8566.

1.1 What's New in This Edition

This edition of *Directive 007-1* rescinds

- *Interim Directive (ID) 99-02 plus Amendment: Revised Policy on Administration of Oil MRL's and Overproduction and Revisions to Enforcement Ladder for Retirement of Overproduction*, and
- *ID 97-01: Horizontal Oil Wells – Revised Production Rate Limitation*.

Major changes to this version of *Directive 007-1* are

- updated compliance information, in accordance with *Directive 019: EUB Compliance Assurance—Enforcement*,
- elimination of EOR projects that have been replaced by EOR approvals, and
- updates to the flaring requirements during the new oil well production period (NOWPP).

2 Base Maximum Rate Limitation

The base MRL is the maximum rate of production for a production entity unless the base MRL is reduced by any applicable gas-oil ratio or off-target penalties (see Section 3). The standard base MRL assigned to a single-well pool is the greater of the reserve-based preliminary rate limitation (PRL) or the basic well rate (BWR) (see Figure 1). The PRL, expressed in cubic metres per day (m^3/d), is calculated as the product of a pool's recoverable

oil reserves (in units of thousand [10^3] m^3) and the constant 0.296. Continuous production at the PRL rate would deplete a pool in 9.25 years. For multiwell pools, a well's base MRL is the pool MRL divided by the number of non-abandoned oil wells in the pool.

Example

Number of nonabandoned oil wells in the pool = 2
BWR = 10.0 m^3/d/well
Recoverable reserves (RiN) = 98.0 $10^3 m^3$

Pool MRL = 98.0 x 0.296 = 29.0 m^3/d
Well base MRL = $\frac{\text{the greater of the BWR or pool MRL}}{\text{number of nonabandoned oil wells}}$

= the greater of 10.0 m^3/d or $\frac{(29.0\ m^3/d)}{2}$

= 14.5 m^3/d

2.1 Nonconfidential Pools—MRL Order

The EUB issues monthly MRLs through the MRL Order posted on the EUB Web site several days prior to the month in which it applies. The MRL Order lists the MRLs for all active nonconfidential oil pools, including pools subject to good production practice (GPP). Pools subject to GPP are not restricted by a base MRL or gas-oil ratio (GOR) penalties; however, any special conditions prescribed in Appendix II of the MRL Order must be adhered to. Operators producing under GPP are expected to produce the wells in accordance with good engineering practices to optimize oil recovery.

The MRL Order contains two appendices: Appendix I provides base MRL data on all nonconfidential pools; Appendix II (Special Provisions) provides details on any applicable special requirements prescribed in Column 7 of Appendix I. Operators producing from pools subject to special provisions must determine whether these provisions apply to the specific production entity they operate.

It is important for operators to refer to the MRL Order on a monthly basis to ensure that all relevant data for calculating a given monthly allowable are taken into account. An example of Appendix I to the MRL Order is shown in Figure 2, and definitions for each column of the data in the appendix are in Figure 3.

Calculation of a monthly base MRL (i.e., unpenalized MRL, or the MRL before any reduction due to penalties [see Section 3]) for a single well within a defined pool is equal to the MRL as set out in column 5 of Appendix I times the number of days in the month.

Example

To calculate the base MRL for a well in the Ante Creek Dunvegan D Pool (see Figure 2):

Base MRL from Column 5 = 12.0 m^3/d
Number of days in the month = 31
Base MRL = Daily base MRL x number of days in the month
= 12.0 m^3/d x 31 d = 372.0 m^3 for the month

This monthly base MRL may be subject to reduction by any applicable penalties, as described in Section 3.

2.2 Confidential Pools—EUB Form O-38

Allowables for wells producing from confidential pools are not listed in the MRL Order but are prescribed on the EUB Form O-38: Application for a New Well Base Allowable or Base MRL (see Figure 4).

For wells that define a new pool or wells drilled outside existing pool order boundaries, operators must complete Form O-38 in duplicate and submit to the EUB Geology and Reserves Group within 30 days of initial production. If applicable, the EUB will assign a base MRL and a base GOR. Form O-38 is returned to the operator for use in calculating allowables for the well.

Calculation of the base MRL for a single well producing from a confidential pool is the product of the base MRL as indicated on Form O-38 multiplied by the number of days in the month.

Example

To calculate the base MRL for a well from Form O-38:

MRL from Form O-38	= 18.0 m^3/d
Number of days in the month	= 31
Base MRL	= Daily base MRL x number of days in the month
	= 18.0 m^3/d x 31 d = 558.0 m^3 for the month

This monthly base MRL may be subject to reduction by any applicable penalties, defined in Section 3.

Interim MRL

For undefined wells for which an O-38 has not been approved and an MRL has not been assigned, the EUB will assume an interim MRL of 8.0 m^3/d and a base GOR of 70 m^3/m^3 following the new oil well production period (NOWPP), defined in Section 6.

2.3 Horizontal Well Modifier

The horizontal well modifier (HWM) was designed to encourage, where appropriate, the drilling of horizontal wells rather than multiple vertical wells. When multiplied by the well base MRL, the HWM increases the allowable in relation to the horizontal length of the well.

Rules governing allowables for horizontal wells are as follows:

- The operator must request EUB approval of an HWM in writing.
- The base MRL is equal to the product of the HWM and the base MRL that would be assigned to a vertical well, where:

  HWM = square root of (1 + L/100), truncated to 1 decimal, and L = length of the well's horizontal section in metres, calculated as the difference in log depth from the pay top of the productive zone to the well's total depth (TD) or plugback depth.

- During NOWPP, the base MRL is the greater of 20.0 m^3/d or the well base MRL multiplied by the HWM, subject to all other conditions of the NOWPP.
- In pools subject to special MRL, the base MRL is equal to the HWM multiplied by the special MRL.

- HWMs are specified in clause 9a of Appendix II to the MRL Order for nonconfidential pools, and on Form O-38 for confidential pools.

Figure 5 illustrates the following example of a base MRL calculation for a well assigned an HWM:

Base MRL of a horizontal well during NOWPP:

NOWPP MRL	= 20.0 m^3/d
HWM	= 2.0
Number of days in the month	= 30
Base MRL	= NOWPP MRL x HWM x days in the month
	= 20.0 m^3/d x 2.0 x 30 d
	= 1200.0 m^3 for the month

Base MRL of a horizontal well on MRL (after NOWPP):

MRL	= 8.0 m^3/d
HWM	= 2.0
Number of days in the month	= 31
Base MRL	= Daily MRL x HWM x days in the month
	= 8.0 m^3/d x 2.0 x 31 d
	= 496.0 m^3 for the month

2.4 Other MRL Considerations

1) Applications for a new well MRL (Form O-38) should be submitted within the first month of production. In the case of horizontal wells, Form O-38 must be submitted unless the entire length of the horizontal section is within the existing EUB Pool Order. If only an enhanced recovery mechanism is listed for a pool in the MRL Order, Form O-38 is required to set a primary allowable for a new primary well being drilled into the pool.

2) The Board may assign GPP status for new pools if conservation is clearly not an issue. However, operators must not assume GPP status except if it is specifically authorized in the MRL Order. If GPP is not approved through the O-38 process, application for GPP can be made in accordance with *Directive 065: Resources Applications for Conventional Oil and Gas Reservoirs.*

3) For a new well to receive the MRL/GPP status prescribed for an existing EOR scheme, the well must be within the scheme's existing approval area as defined for the pool by the EUB's EOR Approval. To add a new well to an existing EOR approval, application must be made to expand the scheme's approval boundaries in accordance with *Directive 065.*

3 Penalties

3.1 Gas-Oil Ratio Penalty

GOR penalties are applied to production entities when the producing GOR exceeds the base GOR. They are imposed to limit production primarily to optimize oil and gas conservation. The base GOR is prescribed in column 6 of Appendix I to the MRL Order for nonconfidential pools and on Form O-38 for confidential pools.

The base GOR is determined from the formula below, as set out in Schedule 6 of the *Oil and Gas Conservation Regulations (OGCR)*:

$$\text{Base GOR } (m^3/m^3) = Rsi + 1.67\,\frac{(Pb + 101.325)}{Tf + 273.15}$$

Where Rsi = initial solution GOR
Pb = bubble point pressure
Tf = reservoir temperature

The reservoir parameters used in the formula are determined from pressure volume temperature (PVT) analysis, when available, or from standings correlation.

The GOR penalty factor is calculated as the base GOR divided by the producing GOR. This penalty factor is then multiplied by the base MRL to determine the adjusted MRL. Note that the EUB reports gas production in units of 10^3 m^3 and oil in units of m^3.

Example

For a well with the following production data:

Monthly base MRL = 372.0 m^3 (calculated from example in Section 2.1)
Base GOR = 130 m^3/m^3
Monthly oil production = 219.2 m^3
Monthly gas production = 56.1 10^3 m^3

Produced GOR $= \frac{\text{Gas production}}{\text{Oil production}} = \frac{56.1\ 10^3\ m^3}{219.2\ m^3} = 256\ m^3/m^3$

GOR penalty factor $= \frac{\text{Base GOR}}{\text{Produced GOR}} = \frac{130\ m^3/m^3}{256\ m^3/m^3} = 0.51$

Adjusted MRL = monthly base MRL x GOR penalty factor
= 372.0 m^3/month x 0.51
= 189.7 m^3 for the month

Note that the GOR penalty factor is equal to 1.0 when the produced GOR is less than or equal to the base GOR.

3.1.1 Applying the GOR Penalty Factor to the Base MRL

The adjusted MRL for a given month is calculated using the GOR penalty factor from the **third preceding month**. This enables operators to forecast future months' allowables using available production data. For example, when calculating the penalized MRL for April, use the GOR penalty factor from the January production data. If there is no production in the third preceding month (January), use the second preceding month (February). If there is no production in the second preceding month (February), use the first preceding month (March). Use the current-month GOR penalty factor against that month and the following three months if there has been no production over the previous three months or if the production entity is subject to any of the following changes:

- base GOR change
- commencement of gas conservation for pools subject to net GOR penalty relief
- first month after NOWPP

- first month after production test
- formation of a new block
- GPP/net GOR penalty relief rescinded or expired

3.1.2 Net GOR Penalty Relief

Where gas is conserved and upon successful application, the EUB may grant relief from GOR penalties on the basis of net gas production. Application for GOR penalty relief is made under Section 10.060 of the *OGCR* in accordance with *Directive 065*.

If net GOR penalty relief is granted, the net produced GOR is calculated on the volume of gas flared and vented, not on the month's total gas production.

If the net produced GOR is less than the base GOR, the GOR penalty factor is equal to 1.0.

$$\text{Net Produced GOR} = \frac{\text{Gas flared + vented}}{\text{Oil production}}$$

$$\text{Net GOR penalty factor} = \frac{\text{Base GOR}}{\text{Net produced GOR}}$$

Multiwell facilities must prorate the battery flared/vented volume to individual wells based on their prorated share of total battery production (reported through the volumetric submission to the Petroleum Registry of Alberta).

$$\text{Well's gas flared/vented} = \frac{\text{Well's gas production x (total battery flared + vented)}}{\text{Total battery gas production (includes other receipts)}}$$

3.2 Off-Target Penalty

When a well is completed outside its prescribed target area, an off-target penalty factor may be imposed against the base MRL. The following conditions apply to off-target penalties:

1) An operator is responsible for surveillance of off-target wells. An off-target penalty will be assessed upon successful application from a competitive operator in accordance with Section 4.060 of the *OGCR*.

2) If a well is spudded on or after April 1, 1994, and is the first well in a new pool, off-target penalties are not applied. For oil wells, "first well" means a well in a new pool with the earliest spud date that is placed on production within six months of the spud date (Sections 4.060[5] and [6] of the *OGCR*).

3) The off-target penalty factor (as described in Schedule 14 of the *OGCR*) is always applied to the base MRL first, followed by any applicable GOR penalties.

4) The off-target penalty factor normally does not reduce the base MRL below 5.0 m^3/d.

5) For GPP pools, the EUB determines the rate against which to apply the off-target penalty.

6) Off-target penalties in effect for pools on GPP status are listed in clause 5 and for MRL pools in clause 8 of Appendix II of the MRL Order or in an EUB letter of disposition.

7) Upon successful application for removal of the off-target penalty of a production entity in an MRL pool, in accordance with *Directive 065*, the off-target penalty will no longer be applied and the entity will continue under normal MRL administration.

8) Upon successful application for removal of the off-target penalty of an entity in a GPP pool, any outstanding cumulative overproduction must be retired at the good production practice retirement rate (GRR) (see Section 5.2).

Example

Given the following data:

Daily base MRL	= 10.0 m^3/d
Off-target penalty factor	= 0.25
GOR penalty factor	= 0.60
Number of days in the month	= 31

To calculate the adjusted MRL for the above production entity:

Monthly base MRL	= Daily base MRL x number of days in the month
	= 10.0 m^3/d x 31 d = 310.0 m^3
Off-target adjusted MRL	= the greater of the monthly base MRL x off-target penalty factor
	or 5.0 m^3/d x number of days in the month
	= the greater of 310.0 m^3/m x 0.25 = 77.5 m^3/m
	or 5.0 m^3/d x 31 d = 155.0 m^3/m
Adjusted MRL	= off-target adjusted MRL x GOR penalty factor
	= 155.0 m^3/m x 0.60 = 93.0 m^3 for the month

4 Blocks

Blocks are producing entities containing wells with contiguous drilling spacing units (DSUs) of common ownership. Blocks require demonstration of improved oil recovery under primary depletion. They are administered and produced as single production entities for the purpose of allowables.

Operators must apply for block status in accordance with Part 5 of the *OGCR*. Approval is granted through EUB Form B06A: Appendix to Block Approval (Figure 6), which lists the wells included in the block. It also shows the DSU size of each well that together define the outline of the block. Block approvals can be obtained from EUB Information Services (403-297-8311, and press 2) as serial publication *ST5*.

The daily base MRL for each block is listed in clause 9 of Appendix II to the MRL Order each month. To obtain the monthly base MRL for a block, the daily base MRL is multiplied by the number of days in the month and then reduced by any applicable penalties, as described in Section 3. The producing GOR for the block is calculated based on the total monthly gas production of all the wells divided by the total oil production. When a block is established, the cumulative overproduction of each well included in the block at the end of the month preceding the formation of the block is carried forward into the block.

For a change in owner or operator of a block, a transfer of approval form, as set out in Appendix D of *Directive 065*, must be submitted. If ownership in a block is no longer common, an application must be submitted to rescind or amend the block approval.

4.1 Oil Control Wells

An oil control well is defined as a well capable of producing oil that is within a block and is completed in a DSU contiguous to a DSU containing a producing well outside the block (Section 1.020(2) (5)(i) of the *OGCR*).

Control well status is imposed in accordance with Section 10.170 (1) of the *OGCR* upon written request. In the event of a control well being off target, the off-target penalty factor is applied against the block allowable and against the control well. In blocks, the control well rate is equal to that assigned to other wells outside the block as prescribed in the MRL Order.

5 Overproduction

The MRL system is administered to preserve conservation and equity within a pool and to provide a level playing field for all operators. The EUB considers overproduction to be any production in excess of the adjusted MRL for a production entity. The EUB recognizes that minor overproduction may occur from time to time and therefore no penalty is assessed if overproduction is less than 10% of the adjusted MRL. Overproduction is the cumulative status (the sum of the previous and the current month's overproduction, including any penalty).

To discourage overproduction, the EUB applies an overproduction penalty to any production entity if the overproduction exceeds 10% of its adjusted MRL. Furthermore, to promote timely retirement of overproduction, the EUB requires that **all cumulative overproduction exceeding 10% of a production entity's adjusted MRL must be retired (reduced to zero status) by the end of the third month following the first month of overproduction.** Overproduction is retired by producing less than the adjusted MRL or shutting in the well in the month(s) following overproduction.

Note that underproduction in any month is used to offset the previous month's cumulative overproduction status. However, underproduction may not be carried forward to be used in later months, except during NOWPP.

5.1 Overproduction Penalty

A 50% overproduction penalty is assessed each month that the monthly overproduction exceeds 10% of the adjusted MRL. This penalty is calculated as 50% of the difference between the reported monthly production and 110% of the adjusted MRL. All cumulative overproduction, including penalties, must be retired within three months once overproduction exceeds 10% of the adjusted MRL.

Example

Calculation of monthly overproduction penalty for May 2001 is shown in Figure 7, using the following data:

Monthly oil production = 292.8 m^3

Monthly adjusted MRL = 248.0 m^3

Monthly overproduction = monthly production – adjusted MRL
= 292.8 m^3 – 248.0 m^3 = 44.8 m^3

110% of adjusted MRL = adjusted MRL x 1.1
= 248.0 m^3 x 1.1 = 272.8 m^3

Overproduction penalty = (Production – 110% of adjusted MRL) x 0.5
= (292.8 m^3 – 272.8 m^3) x 0.5 = 10.0 m^3

Calculation of cumulative status to May 2001, illustrated in Figure 7:

Prior cumulative status = 15.5 m^3 (April 2001)
Monthly overproduction = 44.8 m^3
Overproduction penalty = 10.0 m^3
Cumulative status = Prior cumulative status + monthly overproduction + overproduction penalty
= 15.5 m^3 + 44.8 m^3 + 10.0 m^3 = 70.3 m^3

5.2 GPP Retirement Rate (GRR)

When a change in the pool's MRL administration has been approved, any outstanding overproduction must be retired at the new pool allowable. If GPP status is approved, retirement of any outstanding overproduction is at the GRR of the individual overproduced production entity commencing with the month GPP is approved. The GRR is the greater of the MRL or the average operating-day rate of the production entity during the months overproduced.

Example 1, as illustrated in Figure 7:

Base MRL = 8.0 m^3/d
Months overproduced = April to July
Production from April to July = 255.5 m^3 + 292.8 m^3 + 302.7 m^3 + 335.5 m^3 = 1186.5 m^3
Producing hours from April to July = 672 + 696 + 704 + 720 = 2792 hours (as reported in the volumetric submission to the Petroleum Registry of Alberta)
GPP Granted = September

$$GRR = \frac{\text{Production from months overproduced}}{\text{Producing hours from the months overproduced}} \times 24 \text{ hours/day (hr/d)}$$

$$= \frac{1186.5\ m^3}{2792 \text{ hours}} \times 24 \text{ hr/d} = 10.2\ m^3/d$$

If a well is overproduced during its NOWPP, the GRR is calculated based on the month(s) the well's cumulative production exceeds the total NOWPP allowable.

Example 2, as illustrated in Figure 8:

Total NOWPP allowable = 2400.0 m^3
NOWPP months = June, July, August, September
Cumulative production (June – September) = 500 m^3 + 800 m^3 + 800 m^3 + 1500 m^3 = 3600 m^3
Month that cumulative production exceeds total NOWPP allowable (2400 m^3) = September
GPP granted = October
September production = 1500 m^3
September hours = 720 (as reported in the volumetric submission to the Petroleum Registry of Alberta)

$$GRR = \frac{\text{Production from month in which cumulative production exceeds NOWPP allowable}}{\text{Producing hours from the month in which cumulative production exceeds NOWPP allowable}} \times 24 \text{ hr/d}$$

$$= \frac{\text{September production}}{\text{September hours}} = \frac{1500 \text{ m}^3}{720 \text{ hours}} \times 24 \text{ hr/d} = 50.0 \text{ m}^3/\text{d}$$

Note that GOR penalties are not assessed when applying the GRR. However, any off-target penalty in effect would apply.

5.3 Compliance and Enforcement

To ensure a level playing field for all operators and to promote a more timely retirement of overproduction, the EUB will enforce any noncompliance if the operator of a production entity fails to retire (to zero status) all cumulative overproduction exceeding 10% of the adjusted MRL by the end of the third month following the first month of overproduction. Failure to retire all overproduction will result in enforcement in accordance with *Directive 019: Compliance Assurance—Enforcement*. Self-disclosures on retirement of oil overproduction are not accepted.

The following example illustrates a noncompliant overproduced well (the data for this example are found in Figure 7).

Production month	Level of enforcement	Months overproduced	Cumulative overproduction status	*Comments*
April 2001	Noncompliance	0	15.5 m^3	Well cumulative status (15.5 m^3) is < 10% of the adjusted MRL of 240.0 m^3, or 24.0 m^3.
May 2001	Notice	1	70.3 m^3	Well cumulative overproduction status is > 10% of the adjusted MRL of 248.0 m^3 or 24.8 m^3. All overproduction must be retired (to zero status) within three months (August 31, 2001).
August 2001	High Risk enforcement action	4	23.3 m^3	Well cumulative status not reduced to **zero** status by August 31, 2001.

If the EUB has received amended production data for any production entity for prior month(s) and processing of the amended data indicates that the production entity is in an overproduction status, the EUB will apply enforcement action for the month(s) the production entity is overproduced. If enforcement action has been issued and amended production data indicate that previous enforcement action should be removed, the EUB will remove the enforcement action.

Note that production data amendments may be subject to review by the EUB Production Operations Audit Section.

5.4 Allowable Record

The EUB maintains an allowable record for each production entity on MRL. This record should be used as a basis for comparison with the operator's own records. An operator is responsible for the correct maintenance of the allowable records for the wells it operates.

Allowable records for all nonconfidential production entities are available to the public from EUB Information Services (403-297-8311). Allowable records for all confidential production entities are available to the current operator (the company reporting the production data on the Petroleum Registry of Alberta).

5.5 Waiver of Overproduction

The EUB may grant a waiver of overproduction in unique situations if an operator can demonstrate in writing that retiring the overproduction would compromise conservation. Request for waiver of overproduction should be directed to Section Leader, Enforcement and Surveillance Section, EUB Resources Applications Group.

6 New Oil Well Production Period

NOWPP provides new oil wells with operational flexibility to gather production data on new wells subject to the following conditions:

1) NOWPP consists of the first four producing months and commences with the earlier of the first month in which there is new oil production or the on-production month reported through the well status change on the Petroleum Registry of Alberta.

2) Base MRL during NOWPP is the greater of 20.0 m^3/d or the reserve-based MRL.

3) NOWPP is considered as a single production period for overproduction administration, meaning that underproduction may be carried forward within NOWPP.

4) NOWPP expires one year from the on-production month.

5) GOR and overproduction penalties are not applied during NOWPP; however, any overproduction incurred during this period must be retired.

6) Off-target penalties may be applied during NOWPP.

7) The GOR of the first producing month after the expiration of NOWPP is used to determine the GOR penalty factor for that month and the following three months.

8) New wells completed within a block are not eligible for NOWPP.

9) Upon written notification to the Reserves and Allowables Section of the EUB Geology and Reserves Group, shut-in month(s) within NOWPP may be counted as producing month(s) to reduce overproduction.

10) For horizontal wells producing under NOWPP, the MRL is the product of the MRL and the HWM.

11) Effective February 1, 2007, upon written request to the Reserves and Allowables Section of the EUB Geology and Reserves Group, the EUB may delay the commencement of NOWPP if an oil well's solution gas is flaring for testing, cleanup, and completion to obtain data for economic evaluation and for sizing conservation equipment. Flaring must be in the first month of production and should not exceed a total of 72 hours, in accordance with *Directive 060: Upstream Petroleum Industry Flaring, Incinerating, and Venting*. The well must remain shut in after the 72 hour test until the gas is tied in and conserved. These requests will only be considered after the gas is being conserved.

7 Gas Allowables

A gas well is normally permitted to produce unrestricted and in accordance with good engineering practices. However, there are three situations when the EUB may issue a gas allowable (GA) order for the purpose of setting the maximum cumulative gas production or gas production rate for a gas well or wells in a pool:

- when the ultimate recovery of gas may be adversely affected by unrestricted production rates (Section 10.300[1] of the *OGCR*);
- when a gas well is completed outside of its prescribed target area and it is necessary to apply an off-target penalty to the well's base allowable (Section 4.070[1] of the *OGCR)*;
- when the EUB has approved a fractional section as a DSU and there is a need to apply an area-ratio production penalty or off-target penalty for equity reasons (Section 4.050[1] and [2] of the *OGCR*).

If a well is spudded on or after April 1, 1994, and is the first well in a new pool, off-target penalties are not applied. For gas wells, the "first well" is the well in a new pool with the earliest spud date that is completed and for which suitable tests demonstrate the ability to produce gas at commercial rates on a sustained basis (Sections 4.060[5] and [6] of the *OGCR*).

Section 10.095 of the *OGCR* designates that the base allowable for a gas well is its maximum daily allowable (Q_{max}). The calculation of Q_{max} is explained in Section 10.300(1)(c) of the *OGCR*. Penalties are applied against the well's Q_{max} and an annual allowable is assigned based on this Q_{max} and the number of days in the allowable year or remaining in the allowable year.

The assigned allowable for an off-target gas well, fractional section DSU, or well(s) in a pool for conservation reasons is effective the date given in the disposition letter. Allowables assigned by letter are coalesced into a GA order issued each year in January and updated quarterly throughout the allowable year. The penalty factor and Q_{max} for confidential wells will continue to be assigned by disposition letter only.

An annual pressure survey must be submitted by November 1 for an allowable to be assigned for the following allowable period (commencing January 1). Failure to submit a pressure test by November 1 will result in the assignment of a zero allowable for the next allowable period. All wells with a zero allowable must be shut in by January 1 and remain shut in until an application in accordance with Section 3.6 of *Directive 065* has been approved and an allowable is assigned.

To discourage overproduction, the EUB applies a penalty to any gas well if the cumulative overproduction exceeds 20% of a well's allowable. If a well is overproduced, the EUB will increase the overproduction status by an amount equal to 0.5 times the overproduction in excess of 10% of the allowable. The overproduction status of a well is determined after the production data for the month of December have been filed with the EUB. The allowable calculated for the next allowable period will then be adjusted to reflect the overproduction and any overproduction penalty from the previous allowable period. The adjusted (penalized) allowable will be communicated by letter to licensees of overproduced wells after the annual GA order is issued.

If, due to changes in the *OGCR*, a gas well that was previously off target and subject to penalties is no longer off target, the licensee may apply in accordance with Section 3.6 of

Directive 065 to have the off-target penalty removed, provided that all cumulative overproduction has been retired.

Any questions concerning gas allowables should be directed to the EUB Customer Contact Centre at (403) 297-8311.

Example of overproduction penalty for a gas well:

Calculation of penalty at end of accounting period:

Annual allowable	=	25 000.0 $10^3 m^3$
Annual production	=	35 000.0 $10^3 m^3$
Overproduction	=	production—allowable
	=	35 000 $10^3 m^3$ – 25 000 $10^3 m^3$
	=	10 000 $10^3 m^3$
Production subject to penalty	=	overproduction—10% of allowable (25 000 $10^3 m^3$)
	=	10000 $10^3 m^3$ – 2500 $10^3 m^3$
	=	7500 $10^3 m^3$
Penalty	=	production subject to penalty x 0.5
	=	7500 $10^3 m^3$ x 0.5
	=	3750 $10^3 m^3$
Status at next accounting period	=	overproduction + penalty
	=	10 000 $10^3 m^3$ + 3750 $10^3 m^3$
	=	13 750 $10^3 m^3$

8 Glossary

Adjusted MRL/Allowable	Maximum rate limitation of production for a production entity after penalty factors have been applied.
Base Allowable/Base MRL	The amount of production that, according to a Board Order, could be taken if no penalty factor were to be applied.
Base GOR	Defined in Schedule 6 of the *OGCR* using the formula $\text{Base GOR } (m^3/m^3) = Rsi + 1.67 \frac{(Pb + 101.325)}{Tf + 273.15}$
Block	An area or part of a pool consisting of wells grouped for the purpose of obtaining a common aggregate production allowable.
Board	Alberta Energy and Utilities Board (EUB).
Cumulative Overproduction Status	Sum of all previous months' overproduction plus the current month's overproduction, including any penalty.
Enhanced Recovery Approval Area	The area of a pool recognized as being operated under enhanced recovery.
EUB	Alberta Energy and Utilities Board (Board).
Gas Allowable	The maximum cumulative gas production that, according to a Board Order, could be taken in the prescribed time period.
GOR	Gas-oil ratio: the monthly gas production divided by the monthly oil production.
GOR Penalty Factor	Base GOR divided by the produced GOR.
GPP	Good production practice: when production is not governed by a base allowable but is conducted in accordance with sound engineering principles.
GRR	GPP retirement rate: the rate at which overproduction is retired once GPP is approved.
HWM	Horizontal well modifier: a factor, greater than 1.0, assigned to a horizontal well that is applied to the base MRL.
Net GOR	The ratio of monthly volume of gas flared and/or vented divided by oil production.
Net GOR Penalty Factor	Base GOR divided by the net GOR.
Off-Target	A well that is completed outside its prescribed target area pursuant to the *OGCR*.

Off-Target Penalty Factor	Factor (less than 1.0) that is applied against the base MRL for an off-target well.
Overproduction	Any production in excess of the adjusted MRL.
PRL	Preliminary or initial estimate of the MRL applicable to a production entity.
Q_{max}	The maximum daily allowable of a gas well, determined in accordance with Section 10.300 of the *OGCR*, that is used to calculate the maximum cumulative production for a penalized gas well.
Target Area	The part of a DSU within which a well may be completed for the purpose of producing oil or gas without reduction of its allowable because of its location.

9 Data Precision

The number of decimal places to be used in calculations is as follows:

Items	No. of decimal places
Adjusted MRL	1
Base GOR	0
BWR	1
Cumulative overproduction status	1
Daily MRL	1
Gas flared/vented	1
GOR	0
GOR penalty factor	2
GRR	1
HWM	1
Monthly oil/gas production	1
Monthly overproduction penalty	1

Note that in rounding, add 5 to the last digit and then drop the last digit of the sum.

Figure 1. ***Oil and Gas Conservation Regulations*, Schedule 5, Tabulation of Basic Well Rates**

Schedule 5

Tabulation of Basic Well Rates

Effective 1 February 1984

Pool Average Well Depth – M	Basic Well Rate – m^3 per day
0-2000	8.0
2001-2100	8.5
2101-2170	9.0
2171-2230	9.5
2231-2290	10.0
2291-2340	10.5
2341-2390	11.0
2391-2440	11.5
2441-2490	12.0
2491-2530	12.5
2531-2570	13.0
2571-2610	13.5
2611-2650	14.0
2651-2690	14.5
2691-2730	15.0
2731-2760	15.5
2761-2790	16.0
2791-2820	16.5
2821-2850	17.0
2851-2880	17.5
2881-2910	18.0
2911-2940	18.5
2941-2970	19.0
2971-3000	19.5
3001 and deeper	20.0

AR 151/71 Sched. 5:140/72;229/79;264/84

Figure 2. Example of Appendix I to the MRL Order

EUB Alberta Energy and Utilities Board

Appendix I to MRL Order No. 145

October 2001

1 Field / Pool Name	2 Pool Type	3 Codes			4 Basic Well Rate (m^3/day)	5 Maximum Rate Limitation (m^3/day)	6 Base GOR (m^3/m^3)	7 Special Provisions (See Appendix II)
		Field	Pool	Pool Type				
AMIGO (Continued)								
KEG RIVER B	Prim	0037	788002	00	8.0	GPP		
KEG RIVER C	Prim	0037	788003	00	8.0	GPP		
KEG RIVER E	Prim	0037	788005	00	8.0	8.0	220	
KEG RIVER G	Prim	0037	788007	00	8.0	41.1	250	
KEG RIVER J	WF	0037	788010	20	8.0	GPP		
KEG RIVER K	Prim	0037	788011	00	8.0	GPP		
KEG RIVER O	Prim	0037	788015	00	8.0	GPP		
ANTE CREEK								
DUNVEGAN D	Prim	0055	192004	00	8.0	12.0	130	9a
NORDEGG A	Prim	0055	444001	00	8.0	GPP		
BEAVERHILL LAKE	Prim	0055	744000	00	20.0	GPP		
BEAVERHILL LAKE	SF	0055	744000	10	20.0	GPP		
BEAVERHILL LAKE B	Prim	0055	744002	00	20.0	GPP		
ANTE CREEK NORTH								
TRIASSIC A	Prim	0056	500001	00	8.0	8.0	230	
TRIASSIC C	Prim	0056	500003	00	8.0	GPP		12
TRIASSIC E	Prim	0056	500005	00	8.0	GPP		12a
TRIASSIC L	Prim	0056	500012	00	8.0	8.0	180	
WABAMUN A	Prim	0056	658001	00	14.0	GPP		
ANTELOPE								
DETRITAL C	Prim	0060	350003	00	8.0	GPP		
ARMADA								
UPPER MANNVILLE A	Prim	0062	250001	00	8.0	GPP		
UPPER MANNVILLE O	Prim	0062	250015	00	8.0	GPP		
UPPER MANNVILLE P	Prim	0062	250016	00	8.0	8.0	110	
ARMISIE								
BLAIRMORE	Prim	0070	244000	00	8.0	GPP		12
ASTOTIN								
VIKING H	Prim	0073	218008	00	8.0	GPP		
UPPER MANNVILLE H	Prim	0073	250008	00	8.0	8.0	130	
ATLEE-BUFFALO								
UPPER MANNVILLE A	Prim	0085	250001	00	8.0	GPP		
UPPER MANNVILLE F	Prim	0085	250006	00	8.0	GPP		
UPPER MANNVILLE G	Prim	0085	250007	00	8.0	8.0	70	1
UPPER MANNVILLE P	Prim	0085	250016	00	8.0	GPP		12
UPPER MANNVILLE CC	Prim	0085	250029	00	8.0	GPP		
UPPER MANNVILLE DD	Prim	0085	250030	00	8.0	GPP		12
UPPER MANNVILLE KK	Prim	0085	250037	00	8.0	GPP		
GLAUCONITIC A	Prim	0085	300001	00	8.0	GPP		
GLAUCONITIC B	Prim	0085	300002	00	8.0	8.0	70	
GLAUCONITIC G	Prim	0085	300007	00	8.0	GPP		
GLAUCONITIC H	Prim	0085	300008	00	8.0	GPP		
GLAUCONITIC L	Prim	0085	300012	00	8.0	GPP		
GLAUCONITIC P	Prim	0085	300016	00	8.0	8.0	80	1
AUBURNDALE								
WAINWRIGHT A	Prim	0089	278001	00	8.0	GPP		
WAINWRIGHT B	Prim	0089	278002	00	8.0	GPP		
BADGER								
UPPER MANNVILLE B	WF	0090	250002	20	8.0	GPP		12a, 12c

Figure 3. Definitions of each column in an MRL Order

Appendix I to the MRL Order

Columns	Definitions
1	Field/pool names as defined by the EUB
2	Pool type - recovery mechanism for the pool (code): Prim - Primary Depletion (00) SF - Solvent Flood (10) WF - Water Flood (20) PF – Polymer Flood (21) GF - Gas Flood (40)
3	Field, pool, and pool type codes as defined by the EUB
4	Basic Well Rate (BWR) - the lowest unpenalized MRL assigned to a producing oil well in a pool or pool type; related to the average well depth of the pool, as tabulated in Schedule 5 of the *OGCR* (see Figure 1)
5	MRL (for the wells in a pool or pool type; pools on GPP are not subject to an MRL, unless other directives are specified in Appendix II of the MRL Order)
6	Base GOR (as calculated in accordance with Schedule 6 of the *OGCR*)
7	Special provisions applicable to pools or to individual entities in a pool type (the specific clauses are described in Appendix II of the MRL Order)

Figure 4. EUB Form O-38

EUB Alberta Energy and Utilities Board

Application for a New Well Base Allowable or Base MRL

Submit form in duplicate within 30 days of initial oil production.

Confidential pools and undefined areas only

Well name_____ Unique well identifier | | | | | | W | | | (LE LSD SEC TWP RGE M ES)

Field_____ Pool_____ Formation_____

KB elevation_____m Finished drilling date (yyyy mm dd) | | | | On production date (yyyy mm dd) | | | |

Initial production data	Date yyyy	mm	dd	Hours	Production method	Choke/ strokes	Clean oil production	GOR (m^3/m^3)	Water cut (%)	Oil density (kg/m^3)

Submit any additional supporting evidence of your pool designation.

OPERATOR'S SUBMISSION

	FOR EUB USE ONLY		
G/O interface ☐ or porosity top ☐ m(KB)			
O/W interface ☐ or porosity base ☐ m(KB)			
Cored interval .....m(KB)			
Perforated interval .....m(KB)			
Lower cutoffs Ø / K ..... % / mD			
Assigned area..... ha			
H, h..... m			
Ø..... fraction			
1-Sw..... fraction			
1/Boi..... fraction			
N..... $10^3 m^3$			
Ri..... fraction			
RiN..... $10^3 m^3$			
Average well depth ..... m			
P_b..... kPa			
Rsi..... m^3/m^3			

Estimated reservoir pressure (gauge) kPa ___ and

Temperature_____°C @_____m(KB)

Unique well identifier | | | | | | W | | | (LE LSD SEC TWP RGE M ES)

Crude oil density ☐ Light and medium ☐ Heavy

BWR_____m^3/d Base MRL_____m^3/d

Base GOR_____m^3/m^3

Pool designation:

_____
Date (yyyy-mm-dd) Signed by

_____
Contact name Company

Contact telephone number_____

FOR EUB USE ONLY **Remarks:**

per **Alberta Energy and Utilities Board**

Date approved (yyyy mm dd) | | | |

O-38 2005-01 Alberta Energy and Utilities Board 640 5 Avenue SW Calgary, Alberta T2P 3G4

Figure 5. Allowable record for a horizontal well

EUB Alberta Energy and Utilities Board

Allowable Record
September 2001

Well Identifier	Field Code	Pool Code	Pool Type	Project	Block	Base GOR	Off-Target Penalty	Horizontal Well Modifier	Operator
00/01-01-001-01W4/0	0998	000098	00	000	000	300	0.0000	2.0	0000

Production Date	Months Over	Net GOR Penalty Relief	Confidential	Remarks
2001-04	0	N	N	Example - well assigned a horizontal well modifier

Month	Oil Production	Gas Production	Prod GOR	Gas Flared	Adjusted MRL	Monthly Over Production	Monthly Penalty	Cumulative OP Status	BWR	Daily MRL	Counter	GOR Penalty	Base GOR
2000-07													
2000-08													
2000-09													
2000-10													
2000-11													
2000-12													
2001-01													
2001-02													
2001-03													
2001-04	1222.0	212.2	174	3.4	1200.0	22.0		22.0	8.0	20.0	11	1.00	300
2001-05	944.4	162.6	172	6.7	1240.0	-295.6		-273.6	8.0	20.0	12	1.00	300
2001-06	1000.0	175.6	176	2.9	1200.0	-200.0		-473.6	8.0	20.0	13	1.00	300
2001-07	1305.6	239.2	183	5.4	1240.0	65.6		-408.0	8.0	20.0	14	1.00	300
2001-08	495.8	90.2	182	2.2	496.0	-0.2			8.0	8.0	21	1.00	300
2001-09	475.7	88.8	187	3.1	480.0	-4.3			8.0	8.0	22	1.00	300

Figure 6. Appendix to Block Approval (ST5)

EFFECTIVE DATE	OPER NO
01 MAR 2001	039

APPENDIX TO BLOCK OR PROJECT APPROVAL

EUB
Alberta Energy and Utilities Board
640 - 5 Avenue SW Calgary, Alberta Canada T2P 3G4

UNIQUE WELL IDENTIFIER							BLOCK OR PROJECT NAME	FIELD	POOL	POOL TYPE	BLOCK NO.	PROJ NO.	BASIC WELL RATE		TOTAL	WELL STATUS
													SUBSISTING	TOTAL	PROD AREA	
LOC	LSD	SEC	TWP	RGE	M	E							M3 DAY			123456
							SAKWATAMAU SETTING F BLOCK NO 1	0614	326006	00	01	000	8.0	16.0	320	
00	09	35	062	14	5	0		0614	326006	00	01	000			64	107000
00	10	35	062	14	5	0		0614	326006	00	01	000			64	107004
00	14	35	062	14	5	0		0614	326006	00	01	000			64	107000
00	04	01	063	14	5	0		0614	326006	00	01	000			64	107004
00	02	02	063	14	5	0		0614	326006	00	01	000			64	107004

B06A 2004-03

* THE DEFINITION OF WELL STATUS CODES ARE IN THE ALBERTA ENERGY and UTILITIES BOARD PRODUCTION ACCOUNTING HANDBOOK

FIELD	POOL	POOL TYPE	BLOCK	PROJECT
0614	326006	00	01	000

EFFECTIVE DATE	OPER NO
01 MAR 2001	039

1

Figure 7. Allowable record with overproduction calculation

EUB Alberta Energy and Utilities Board

Allowable Record

August 2001

Well Identifier	Field Code	Pool Code	Pool Type	Project	Block	Base GOR	Off-Target Penalty	Horizontal Well Modifier	Operator
00/01-01-001-01W4/0	0998	000098	00	000	000	80	0.0000	1.0	0000

Production Date	Months Over	Net GOR Penalty Relief	Confidential	Remarks
2000-12	4	N	N	Example - overproduced well

Month	Oil Production	Gas Production	Prod GOR	Gas Flared	Adjusted MRL	Monthly Over Production	Monthly Penalty	Cumulative OP Status	BWR	Daily MRL	Counter	GOR Penalty	Base GOR
2000-06													
2000-07													
2000-08													
2000-09													
2000-10													
2000-11													
2000-12	352.4	6.9	20	6.9	620.0	-267.6		-267.6	8.0	20.0	11	1.00	80
2001-01	305.0	3.3	11	3.3	620.0	-315.0		-582.6	8.0	20.0	12	1.00	80
2001-02	323.8	6.2	19	6.2	560.0	-236.2		-818.8	8.0	20.0	13	1.00	80
2001-03	292.9	5.3	18	5.3	620.0	-327.1		-1145.9	8.0	20.0	14	1.00	80
2001-04	255.5	3.4	13	3.4	240.0	15.5		15.5	8.0	8.0	21	1.00	80
2001-05	292.8	6.7	23	6.7	248.0	44.8	10.0	70.3	8.0	8.0	22	1.00	80
2001-06	302.7	2.9	10	2.9	240.0	62.7	19.4	152.4	8.0	8.0		1.00	80
2001-07	335.5	5.4	16	5.4	248.0	87.5	31.4	271.3	8.0	8.0		1.00	80
2001-08					248.0	-248.0		23.3	8.0	8.0		1.00	80

Figure 8. Allowable Record with GRR calculation under NOWPP

EUB Alberta Energy and Utilities Board

Allowable Record

October 2006

Well Identifier	Field Code	Pool Code	Pool Type	Project	Block	Base GOR	Off-Target Penalty	Horizontal Well Modifier	Operator
00/01-01-001-01W4/0	0998	999998	00	000	000	150	0.0000	1.0	0000

Production Date	Months Over	Net GOR Penalty Relief	Confidential	Remarks
2006-06	0	N	N	EXAMPLE - NOWPP overproduced well subject to GRR

Month	Oil Production	Gas Production	Prod GOR	Gas Flared	Adjusted MRL	Monthly Over Production	Monthly Penalty	Cumulative OP Status	BWR	Daily MRL	Counter	GOR Penalty	Base GOR
2005-08													
2005-09													
2005-10													
2005-11													
2005-12													
2006-01													
2006-02													
2006-03													
2006-04													
2006-05													
2006-06	500.0	50.0	100	0.0	600.0	-100.0		-100.0	8.0	20.0	11	1.00	150
2006-07	800.0	78.0	98	0.0	620.0	180.0		80.0	8.0	20.0	12	1.00	150
2006-08	800.0	81.0	101	0.0	620.0	180.0		260.0	8.0	20.0	13	1.00	150
2006-09	1500.0	150.0	100	0.0	600.0	900.0		1160.0	8.0	20.0	14	1.00	150
2006-10					1550.0	-1550.0			8.0	50.0	21	1.00	150

Figure 9. Terms on an allowable record

Terms	Definitions
Horizontal well modifier (HWM)	HWM is a factor assigned to a horizontal well. For vertical wells, the HWM is shown as 1.0.
Operator	Code of the operator of the production entity and one who is responsible for any overproduction. For allowable purposes, operator is the company reporting the production data.
Production date	The earlier of the well's on-production date as specified on the well status change on the Petroleum Registry of Alberta or the date of first production.
Months over	Number of months the cumulative overproduction status exceeds 10% of its adjusted MRL or when overproduction is not retired after exceeding 10% of the adjusted MRL.
Net GOR penalty relief	Approval of net GOR penalty relief.
Confidential	Confidential status of the well.
Gas flared	Volume of gas flared or vented.
Adjusted MRL	Monthly MRL for the production entity after all applicable penalties.
Monthly overproduction	Difference between the adjusted MRL and oil production.
Monthly penalty	Penalty assessed on overproduction exceeding 10% of the adjusted MRL.
Cumulative overproduction status	Sum of previous and current month's overproduction, including any penalty.
Counter	For EUB use in adjusting calculation of the MRL.
GOR penalty	GOR penalty factor applied to the base MRL.